Status Report April 1992
IUE Observing Program
University of Colorado
NASA contract number NAG5-350

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1 Observations

We have continued the extensive observing portion of our program and have completed 31 IUE shifts. A complete list of observations are included in table 1 below.

Table 1 IUE OBSERVING LOG - (Januaray 1991- Mar 1992)

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07 Jan 1991 20:00-00:00 MST 1/2 US2 (AGMLW)
V460 Cyg - LWP (lo) 19523 - FES 11558 - 215 minutes - MgII 176; Cont 118; Bkg 85


08 Jan 1991 08:00-16:00 MST   1 US1 (RVMEB)
S Car - LWP (lo) 19525 - FES  16286 - 20 minutes - MgII 165vw; Cont 1.5x; Bkg 38
R Car - LWP (HI) 19526 - FES  2359 - 317 minutes - MgII vw; Cont 125; Bkg 73


21 Jan 1991 08:00-16:00 MST   1 US1 (RVMEB)
S Car - LWP (lo) xyzxy - FES 14700 - 20 minutes - MgII abs; Cont 223; Bkg 38
R Car - LWP (HI) xyzyx - FES  2000 - 360 minutes - MgII 144; Cont 140; Bkg 82


28 Jan 1991 15:20-19:20 MST 1/2 US2 (AGMLW)
T Cam - LWP (lo) 19660 - FES 4273 - 150 minutes - MgII 193; Cont 117; Bkg 52
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07 Feb 1991 04:10-12:10 MST   1 US1 (RVMEB)
S Car - LWP (lo) 19711 - FES 11069 - 20 minutes - MgII 164; Cont 142; Bkg 35
R Car - LWP (HI) 19712 - FES 1770 - 350 minutes - MgII 127; Cont 105; Bkg 72

13 Feb 1991 12:10-16:10 MST 1/2 US2 (AGMLW)
T Cam - LWP (lo) 19751 - FES 4040 - 165 minutes - MgII 6pix>; Cont 162; Bkg 52

20 Feb 1991 12:10-16:10 MST 1/2 US2 (RVMEB)
S Car - LWP (lo) 19805 - FES 7924 - 20 minutes - MgII 191; Cont 82; Bkg 38
R Car - LWP (lo) 19806 - FES 2046 - 40 minutes - MgII vvw; Cont 150; Bkg 38
T Cep - LWP (lo) 19807 - FES 2747 - 20 minutes - MgII 1.5x; Cont 102; Bkg 38

02 Mar 1991 12:00-16:00 MST 1/2 US2 (AGMLW)
T Cam - LWP (lo) 19864 - FES 3135 - 150 minutes - MgII 1.5x; Cont 150; Bkg 72

09 Mar 1991 04:00-12:00 MST 1   US1 (MGMJB)
S Car - LWP (hi) 19878 - FES 2810 - min (300?) - MgII 198; Cont 130; Bkg 70

09 Mar 1991 12:00-16:00 MST 1/2 US2 (MGMJB)
S Car - LWP (hi) 19879 - FES 2810 - min (300?) - MgII 214; Cont na; Bkg 95

10 Mar 1991 04:00-12:00 MST 1   US1 (MGMJB)
S Car - LWP (hi) 19888 - FES 2840 - min 360 - MgII 232; Cont 135; Bkg 80

10 Mar 1991 12:00-16:00 MST 1/2 US2 (MGMJB)
S Car - LWP (hi) 19889 - FES 2840 - min (300?) - MgII 209; Cont 90; Bkg 80

12 Mar 1991 04:00-12:00 MST 1   US1 (MGMJB)
S Car - LWP (hi) 19900 - FES 2725 - min 200 - MgII 160; Cont 100; Bkg 50
S Car - LWP (hi) 19901 - FES 2725 - min 200 - MgII 166; Cont n/a; Bkg 50

12 Mar 1991 12:00-16:00 MST 1/2 US2 (MGMJB)
S Car - LWP (hi) 19902 - FES 2725 - min 180 - MgII 165; Cont n/a; Bkg 65

13 Mar 1991 04:00-12:00 MST 1   US1 (MGMJB)
S Car - LWP (hi) 19910 - FES 2490 - min 280 - MgII 213/138; Cont na; Bkg 50

13 Mar 1991 12:00-16:00 MST 1/2 US2 (MGMJB)
S Car - LWP (hi) 19911 - FES 2490 - min 288 - MgII 216; Cont na; Bkg 80

16 Mar 1991 12:00-16:00 MST 1/2 US2 (AGMLW)
T Cam - LWP (lo) 19929 - FES 2524 - 60 minutes - MgII 3pix>; Cont 80; Bkg 40

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T Cep - LWP (hi)   19930 - FES 2000 - 90 minutes - MgII 208; Cont na; Bkg 50


28 Mar 1991 12:00-16:00 MST 1/2 US2 (RVMEB)
T Cam - LWP (lo)   20003 - FES 2049 - 15 minutes - MgII 178; Cont vw; Bkg 90
T Cam - LWP (lo)   20004 - FES 2049 - 25 minutes - MgII 190; Cont 64; Bkg 40


28 Mar 1991 16:00-20:00 MST 1/2 US2 (AGMLW)
T Cep - LWP (hi)   20005 - FES 2072 - 88 minutes - MgII 172 ; Cont na; Bkg 45


12 Apr 1991 11:00-15:00 MST 1/2 US2 (RVMEB)
T Cam - LWP (lo)   20126 - FES 1410 - 18 minutes - MgII 153; Cont 50; Bkg 35
T Cep - LWP (hi)   20127 - FES 1975 - 42 minutes - MgII 109; Cont na; Bkg 50


27 Apr 1991 11:00-15:00 MST 1/2 US2 (RVMEB)
U Mon - Lwp (hi)   20246 - FES 6758 - 120 min - MgII 143; cont 160; Bkg 60
T Cep - LWP (hi)   20247 - FES 2460 -  70 minutes - MgII 93; Cont na; Bkg 35


10 May 1991 09:00-13:00 MST 1/2 US2 (RVMEB)
S Car - LWP (hi) 20353 - FES 7518 - min 90 - MgII na; Cont 100; Bkg 40
U Mon - LWP (hi) 20354 - FES       - min 60 - MgII ; Cont na; Bkg


24 May 1991 09:00-13:00 MST 1 US2 (RVMEB)
T Cep - LWP (hi) 20438 - FES 3830  -  120 min - MgII 167; Cont na; Bkg 115
R Car - LWP (hi) 20439 - FES 12151 -  25 min  - MgII 82; Cont 125; Bkg 40


26 Nov 1991 19:30-23:30 MST 1/2 US2 (RGNLW)
L2 Pup - LWP (lo) 21858 - FES 508 -  30 min - MgII 69; Cont 83; Bkg 50
L2 Pup - LWP (lo) 21859 - FES 508 -  58 min - MgII 1.1x; Cont ?; Bkg 220
L2 Pup - LWP (lo) 21860 - FES 508 -  35 min - MgII 100; Cont 198; Bkg 150


06 Dec 1991 17:30-21:30 MST 1/2 US2 (RGNLW)
L2 Pup - LWP (lo) 21960 - FES 525 -  30 min - MgII 59; Cont 69; Bkg 35
L2 Pup - LWP (lo) 21961 - FES 525 -  120 min - MgII 140; Cont 208 Bkg 70


26 Dec 1991 18:00-22:00 MST 1/2 US2 (RGNLW)
L2 Pup - LWP (lo) 22095 - FES 595 -  30 min - MgII 53; Cont 61; Bkg 38
L2 Pup - LWP (lo) 22096 - FES 595 -  150 min - MgII 136; Cont 234; Bkg 83
L2 Pup - LWP (lo) 22097 - FES 595 -  145 min - MgII 106; Cont 213; Bkg 55


15 Jan 1992 15:30-19:30 MST 1/2 US2 (RGNLW)
L2 Pup - LWP (lo) 22250 - FES 942 -  40 min - MgII no; Cont 195; Bkg 40
L2 Pup - LWP (lo) 22251 - FES 942 -  110 min - MgII no; Cont 4x; Bkg 140
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05 Feb 1992 12:00-20:00 MST 1 US2 (RGNLW)
L2 Pup - LWP (lo) 22339 - FES 781 -   60 min - MgII 3pix; Cont 162; Bkg 40
L2 Pup - LWP (lo) 22340 - FES 781 -   120 min - MgII 2x; Cont 255; Bkg 55
L2 Pup - LWP (lo) 22341 - FES 781 -   35 min - MgII 1pix; Cont 114; Bkg 40


24 Feb 1992 12:00-20:00 MST 1/2 US2 (RGNLW)
L2 Pup - LWP (lo) 22453 - FES 638 -   15 min - MgII 182; Cont na; Bkg 35
L2 Pup - LWP (lo) 22454 - FES 638 -   40 min - MgII 2x; Cont 98; Bkg 40
L2 Pup - LWP (lo) 22455 - FES 638 -   40 min - MgII 2x; Cont 93; Bkg 42


25 Feb 1992 12:00-20:00 MST 1/2 US2 (RGNLW)
L2 Pup - LWP (hi) 22468 - FES 638 -   195 min - MgII 182; Cont na; Bkg 52


16 Mar 1992 12:00-20:00 MST 1 US2 (RGNLW)
L2 Pup - LWP (lo) 22613 - FES 450 -   10 min - MgII 98; Cont 50; Bkg 32
L2 Pup - LWP (10) 22614 - FES 450 -   40 min - MgII 246; Cont 70; Bkg 39
L2 Pup - LWP (10) 22615 - FES 450 -   20 min - MgII 158; Cont 60; Bkg 38
L2 Pup - LWP (hi) 22668 - FES 450 -   240 min - MgII 132; Cont na; Bkg 60


Scheduled shifts:

06 Apr 92 11:00-19:00 MST 1 US2 (RGNLW)
25 Apr 92 15:00-19:00 MST 1/2 US2 (RGNLW)
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2   Data Analysis

We have concentrated our efforts on analyzing the data from two of our primary targets: S Carina and L_2 Puppis.

2.1   S Carina

Twenty-nine high dispersion images of S Car have been processed. Analysis of the FeI, FeII and MgII emissions is proceeding. The spectral images under investigation are listed in table 2.

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Table 2

LWP1610H.DAT
LWP5842H.DAT
LWP6906H.DAT
LWP7874H.DAT
LWP12008H.DAT
LWP12033H.DAT
LWP12038H.DAT
LWP12044H.DAT
LWP12172H.DAT
LWP12197H.DAT
LWP12304H.DAT
LWP13775H.DAT
LWP13856H.DAT
LWP13904H.DAT
LWP13954H.DAT
LWP14062H.DAT
LWP14117H.DAT
LWP19878H.DAT
LWP19879H.DAT
LWP19888H.DAT
LWP19889H.DAT
LWP19900H.DAT
LWP19901H.DAT
LWP19902H.DAT
LWP19910H.DAT
LWP19911H.DAT
LWP20353H.DAT
LWR11781H.DAT
LWR14135H.DAT
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PROCESSING: Processing the data consisted of running each image through an IUERDAF program called HIGH. A specified number of orders were extracted from the G.O. formatted files and then interactively processed using the Patching, Ripple Correction, Trimming, Blemish Correction(s), and Absolute Flux Calibration routines found in HIGH. A large number of emisison lines have been detected (table 3); for each line in every spectrum, the line flux and central wavelength has been measured. The difficult task of determining identifications for each line is in progress; the line IDs will establish the rest wavelengths and corresponding radial velocities.

Table 3
SPECTRAL LINES FOUND IN S CARINA (wavelengths are in Angstroms):

2344.59	2348.66	2351.12	2356.24	2357.19	2368.86
2371.27	2371.88	2374.45	2379.30	2380.01	2390.91
2392.01	2393.57	2394.94	2395.43	2396.26	2397.00
2400.97	2404.42	2405.80	2414.52	2417.41	2418.12
2419.16	2419.60	2423.89	2426.08	2437.86	2443.66
2445.41	2450.27	2452.30	2454.75	2457.13	2463.85
2464.85	2469.46	2470.52	2472.24	2475.75	2479.64
2483.38	2484.15	2493.96	2495.66	2501.14	2512.94
2525.59	2527.87	2528.53	2538.92	2546.37	2551.19
2554.06	2554.95	2556.71	2557.46	2560.58	2565.29
2567.21	2570.97	2572.99	2575.18	2575.85	2578.36
2578.86	2579.73	2580.91	2582.61	2585.38	2588.63
2600.27	2607.91	2613.60	2614.50	2620.12	2621.17
2622.49	2622.91	2624.44	2625.22	2625.99	2628.18
2630.70	2632.45	2633.97	2637.06	2637.81	2638.38
2638.79	2640.22	2641.99	2642.58	2643.54	2645.69
2648.61	2649.72	2650.88	2653.11	2653.85	2655.18
2656.57	2661.08	2661.87	2663.43	2664.02	2665.82
2666.27	2669.04	2671.34	2672.97	2677.47	2678.78
2679.38	2681.42	2684.08	2688.48	2691.84	2694.54
2695.41	2696.31	2700.71	2701.69	2702.39	2703.81
2704.35	2705.30	2706.38	2708.09	2710.69	2711.97
2713.16	2714.88	2716.65	2717.28	2717.81	2719.08
2719.72	2720.97	2722.42	2724.67	2726.02	2727.25
2729.73	2733.79	2735.22	2739.17	2740.96	2741.37
2741.92	2742.73	2743.99	2744.97	2745.70	2747.70
2748.42	2749.01	2749.45	2749.95	2750.92	2752.64
2753.57	2754.31	2755.50	2758.32	2759.42	2760.11
2761.89	2762.42	2763.99	2766.07	2768.30	2769.58
2772.01	2775.91	2776.86	2777.53	2778.19	2778.62
2780.07	2781.10	2782.05	2782.96	2783.42	2785.07
2785.91	2787.71	2788.75	2790.01	2796.27	2797.37
2798.13	2800.64	2802.45	2803.49	2804.37	2804.78
2806.22	2806.94	2808.12	2809.19	2810.40	2810.95
2811.54	2813.23	2813.82	2815.00	2817.56	2821.58
2823.33	2825.97	2829.21	2829.83	2834.39	2835.67
2836.50	2837.06	2838.05	2838.61	2839.42	2840.31
2841.34	2841.81	2842.69	2843.59	2845.93	2846.75
2848.57	2849.98	2853.80	2854.98	2855.74	2856.89

2859.72	2863.07	2864.99	2866.15	2867.53	2869.58
2870.02	2873.43	2874.43	2875.06	2875.97	2876.39
2876.86	2877.31	2877.76	2878.49	2879.23	2879.70
2880.32	2880.81	2882.64	2883.67	2884.32	2884.85
2885.90	2886.49	2887.14	2887.60	2888.44	2889.12
2891.45	2892.65	2893.44	2895.01	2897.95	2899.24
2900.00	2900.71	2903.37	2904.78	2905.51	2906.34
2907.18	2910.31	2911.39	2912.21	2913.09	2913.50
2914.64	2915.34	2916.34	2916.83	2917.44	2917.95
2918.62	2919.07	2919.48	2920.47	2921.51	2922.07
2922.83	2927.97	2929.50	2931.41	2933.35	2935.05
2938.71	2939.23	2941.65	2942.42	2943.12	2943.78
2944.59	2945.22	2945.93	2947.22	2947.80	2948.50
2949.55	2950.29	2950.86	2951.48	2952.20	2953.67
2954.27	2955.32	2956.66	2957.22	2957.74	2960.13
2964.05	2965.07	2967.64	2968.24	2969.23	2971.15
2972.31	2973.75	2974.51	2975.42	2976.13	2977.64
2978.87	2979.91	2980.39	2980.88	2981.73	2982.35
2983.21	2983.97	2985.32	2985.88	2986.49	2987.24
2987.93	2988.63	2989.21	2989.71	2990.63	2991.81
2992.41	2993.83	2994.48	2996.55	2997.48	2998.39
2999.25	2999.94	3002.62	3005.08	3006.28	3011.03
3017.39	3018.45	3020.81	3021.96	3023.15	3025.29
3026.06	3027.54	3028.05	3029.42	3030.09	

ANALYZING: Another IUERDAF program, called FEATURE, was used in analyzing the processed images. A wavelength region of 691 angstroms (2344 A to 3035 A) was examined. Any significant features (greater than one sigma) were measured and recorded. All emission lines found are listed in table 3. A major effort has been put into trying to identify all of the emission lines found in each image. All the measured emission line data are being collected into a single table containing the following: list all observed emission lines; rest wavelength and line identification (if available); phase; line flux; observed wavelength; image number. The table should provide a means of correlating variability in the phase dependent emission features.

3 L$_2$ Puppis

Ultraviolet MgII flux observations for L$_2$ Puppis during 1985-1987 and the visual light curve for the same epoch are interpreted as indicating that an episode of enhanced dust production began in 1986. Detailed numerical calculations for Mi-

ras and for parameters appropriate for L_2 Puppis indicate that this star is only marginally able to sustain a dusty wind. We suggest that patches of the stellar surface alternate between a quiescent state (with little dust, an extended warm atmosphere, and low atmospheric TiO absorption) and a dusty wind state (with a cooler atmosphere and higher atmospheric TiO absorption). Such a patchy atmospheric structure also provides a natural explanation for the observed time and wavelength dependence of linear polarization in L_2 Puppis. An incidental result of this study is the discovery that L_2 Puppis has a large $\dot{P}$, probably indicating that this star has recently undergone a helium shell flash.

These results were presented at the *Cool Star Conference* in Tucson, Arizona in October 1991. An ApJ paper is in preparation and should be submitted in May 1992.